

AMENDMENTS TO THE CLAIMS

Applicant submits below a complete listing of the current claims, including marked-up claims with insertions indicated by underlining and deletions indicated by strikeouts and/or double bracketing. This listing of claims replaces all prior versions, and listings, of claims in the application:

1-47. (Canceled)

48. (Withdrawn and Currently amended) The apparatus of claim ~~47~~157, wherein the at least one focused acoustic field has a focal zone smaller than the ~~reaction~~-vessel.

49. (Withdrawn and Currently amended) The apparatus of claim ~~47~~157, wherein the at least one focused acoustic field has a focal zone larger than the ~~reaction~~-vessel.

50-54. (Canceled)

55. (Withdrawn and Currently amended) The apparatus of claim ~~54~~162, wherein the processor controls the flow of the at least one sample and the liquid medium based, at least in part, on the determination of the state of treatment.

56. (Withdrawn and Currently amended) The apparatus of claim ~~54~~162, wherein the processor controls ~~the a~~ transducer based, at least in part, on the determination of the state of treatment.

57. (Withdrawn and Currently amended) The apparatus of claim ~~53~~161, wherein the sensor includes an acoustic transducer for detecting acoustic emissions from the ~~one or more samples~~ liquid medium.

58. (Withdrawn and Currently amended) The apparatus of claim ~~53~~161, wherein the sensor includes an acoustic transducer for detecting acoustic reflections from the ~~one or more samples at~~ least one sample.

59. (Withdrawn and Currently amended) The apparatus of claim ~~53~~161, wherein the sensor includes a temperature sensor and the feedback information includes temperature information.

60. (Withdrawn and Currently amended) The apparatus of claim ~~53~~161, wherein the sensor includes optical detection and the feedback information includes spectral information.

61. (Withdrawn and Currently amended) The apparatus of claim 60, wherein the spectral information includes at least one of spectral excitation, absorption, fluorescence, and emission of the ~~one or more samples at~~ least one sample.

62. (Withdrawn and Currently amended) The apparatus of claim ~~141~~157, wherein the at least one focused acoustic field includes a plurality of focused acoustic fields and the acoustic energy source includes a plurality of acoustic transducers for providing the plurality of the focused acoustic fields to the ~~one or more samples at~~ least one sample.

63. (Withdrawn and Currently amended) The apparatus of claim ~~47~~157, including a positioning system for positioning the at least one of the sample and the at least one focused acoustic source field relative to each other.

64. (Withdrawn and Currently amended) The apparatus of claim ~~62~~157, including a processor for controlling ~~the a~~ positioning system to stop sample movement relative to the acoustic energy source to facilitate the treating of the ~~one or more samples at~~ least one sample.

65. (Withdrawn and Currently amended) The apparatus of claim ~~62~~157, including a processor for controlling ~~the a~~ positioning system to dither a relative position of the ~~one or more~~

~~samples at least one sample~~ and the focal zone.

66. (Withdrawn and Currently amended) The apparatus of claim ~~47-157~~, ~~wherein the at least one sample includes at least one of a mineral or a biological material further comprising one or more samples, wherein the one or more samples include organic material.~~

67-69. (Canceled)

70. (Withdrawn and Currently amended) The apparatus of claim ~~47-157~~, ~~further comprising one or more samples, wherein the one or more samples at least one sample is~~ are suspended in a ~~fluid~~ the liquid medium.

71. (Withdrawn and Currently amended) The apparatus of claim 70, wherein the ~~fluid~~ liquid medium includes a solvent.

72-73. (Canceled)

74. (Withdrawn and Currently amended) The apparatus of claim ~~72-157~~, wherein the ~~one or more samples at least one sample includes~~ include a first molecule and the constituent includes a second molecule, and the second molecule is different from the first molecule.

75. (Withdrawn and Currently amended) The apparatus of claim ~~72-157~~, wherein the ~~one or more samples at least one sample includes include~~ an antibody and ~~the constituent includes a~~ molecule to which the antibody binds.

76. (Withdrawn and Currently amended) The apparatus of claim ~~72-157~~, wherein the ~~one or more samples at least one sample includes include~~ a substrate and ~~the constituent includes a~~ ligand.

77. (Withdrawn and Currently amended) The apparatus of claim 72, wherein the ~~one or more samples at least one sample includes include~~ at least one of an antibody and a receptor and ~~the constituent include~~ further comprising a support surface for immobilizing the at least one of the antibody and the receptor.

78. (Withdrawn and Currently amended) The apparatus of claim ~~72-74~~, wherein the ~~one or more samples at least one sample includes include~~ a first nucleic acid molecule and the second molecule includes a second nucleic acid molecule ~~the constituent includes a second nucleic acid, different from the first nucleic acid molecule.~~

79. (Withdrawn) The apparatus of claim 78, wherein the first nucleic acid molecule is a primer and the second nucleic acid molecule is a substrate molecule.

80. (Canceled)

81. (Withdrawn and Currently amended) The apparatus of claim ~~47-157~~, wherein the at least one sample is heated in response to the at least one focused acoustic field treatment ~~includes heating of the sample.~~

82. (Withdrawn and Currently amended) The apparatus of claim ~~47-157~~, wherein a portion of the at least one sample is disrupted in response to the at least one focused acoustic field ~~the treatment includes disrupting at least portions of the sample.~~

83. (Withdrawn and Currently amended) The apparatus of claim ~~47-157~~, wherein permeability of the at least one sample is increased in response to the at least one focused acoustic field ~~treatment includes increasing a permeability of the one or more samples.~~

84. (Withdrawn and Currently amended) The apparatus of claim ~~47-157~~, wherein the treatment includes enhancing a reaction within the one or more samples at least one sample is enhanced in response to the at least one focused acoustic field.

85. (Canceled)

86. (Withdrawn and Currently amended) The apparatus of claim ~~47-157~~, wherein extra-cellular membranes of the at least one sample are disrupted in response to the at least one focused acoustic field ~~the treatment includes disrupting extra-cellular membranes.~~

87. (Withdrawn and Currently amended) The apparatus of claim ~~47-157~~, wherein the treatment includes lessening a barrier function of a structure in the one or more samples at least one sample is lessened in response to the at least one focused acoustic field.

88. (Withdrawn and Currently amended) The apparatus of claim ~~47-157~~, including a processor for controlling the acoustic energy source to be on during a treat interval and off during a dead interval.

89. (Withdrawn) The apparatus of claim 88, wherein the processor controls a frequency of operation of the acoustic energy source.

90. (Withdrawn) The apparatus of claim 88, wherein the processor controls a duty cycle of operation of the acoustic energy source.

91. (Withdrawn and Currently amended) The apparatus of claim 47-157, further comprising a system for transferring the ~~reaction~~ vessel into or out of the ~~a~~ treatment apparatus.

92-141. (Canceled)

142. (Withdrawn and Currently amended) The apparatus of claim 47-157, further comprising a coupling medium for coupling the focused acoustic field to the ~~one or more samples at least one~~ sample, wherein said coupling medium does not contact the at least one sample.

143. (Withdrawn and Currently amended) The apparatus of claim 47-157, wherein the ~~reaction~~ vessel is a conduit.

144. (Withdrawn and Currently amended) The apparatus of claim 143, wherein the at least one sample each of the one or more samples is held within a separate container included within the conduit.

145-147. (Canceled)

148. (Withdrawn and Currently amended) The apparatus of claim ~~144~~-157, wherein the ~~sample~~ vessel comprises a plurality of containers each capable of holding ~~one or more samples at least~~ one sample.

149. (Withdrawn and Currently amended) The apparatus of claim 148, wherein the ~~sample~~ vessel comprises at least one of a microtiter plate, a blister pack, and an array of polymeric bubbles.

150-156. (Canceled)

157. (Currently amended) An apparatus for processing ~~one or more samples~~ at least one sample, comprising:

(a) a ~~reaction~~ vessel for holding the ~~one or more samples~~ at least one sample and including at least one inlet for flowing the ~~one or more samples~~ at least one sample in a liquid medium into the ~~reaction~~ vessel and at least one outlet for flowing the ~~one or more samples~~ at least one sample in the liquid medium out of the ~~reaction~~ vessel; and

(b) an acoustic energy source spaced from and exterior to the vessel for providing at least one focused acoustic field having a frequency of between about 100 kilohertz and about 100 megahertz and having a focal zone having a diameter width of less than about 2 centimeters to the ~~one or more samples~~ at least one sample while the ~~one or more samples~~ are at least one sample is in the ~~reaction~~ vessel, wherein at least a portion of acoustic energy from the acoustic energy source propagates exterior to the vessel.

158. (Withdrawn and Currently amended) The apparatus of claim 157, including a processor for controlling ~~the flow of the liquid medium~~ one or more samples into and out of the ~~reaction~~ vessel to control exposure of the ~~one or more samples~~ at least one sample to the at least one focused acoustic field.

159. (Currently amended) The apparatus of claim 157, including a processor for controlling the acoustic energy source to control exposure of the ~~one or more samples~~ at least one sample to the at least one focused acoustic field.

160. (Withdrawn and Currently amended) The apparatus of claim 157, including a processor for varying ~~a~~ the frequency of the acoustic energy source to control exposure of the ~~one or more samples~~ at least one sample to the at least one focused acoustic field.

161. (Withdrawn and Currently amended) The apparatus of claim 157, including a feedback

system having a sensor for providing feedback information relevant to the ~~one or more samples~~
at least one sample.

162. (Withdrawn and Currently amended) The apparatus of claim 161, including a processor for determining a state of treatment of the at least one sample based, at least in part, on the feedback information.

163. (New) The apparatus of claim 157, wherein the focused acoustic field has a focal zone with a width of less than about 1 cm.

164. (New) The apparatus of claim 157, wherein the focused acoustic field has a focal zone with a width of less than about 1 mm.

165. (New) The apparatus of claim 157, wherein the width corresponds to a diameter of the focal zone.

166. (New) The apparatus of claim 157, wherein the acoustic energy source for providing the at least one focused acoustic field is modulated to produce multiple foci.

167. (New) The apparatus of claim 157, wherein the acoustic energy source for providing the at least one focused acoustic field generates a cigar-shaped focal zone.

168. (New) The apparatus of claim 157, wherein the acoustic energy source for providing the at least one focused acoustic field generates an ellipsoidal shaped focal zone.

169. (New) The apparatus of claim 157, wherein the at least one sample is a fluid.

170. (New) The apparatus of claim 157, wherein the at least one sample and the liquid medium are substantially similar.

171. (New) The apparatus of claim 157, wherein the at least one focused acoustic field sterilizes the at least one sample.
172. (New) The apparatus of claim 157, wherein the at least one focused acoustic field aids the at least one sample to flow toward the at least one outlet.
173. (New) The apparatus of claim 157, wherein the vessel has a width of at least about 10 mm.
174. (New) The apparatus of claim 157, wherein the vessel comprises a treatment chamber, the treatment chamber having substantially vertical walls.
175. (New) The apparatus of claim 157, wherein the vessel comprises a treatment chamber, the treatment chamber having a portion that is substantially conical in shape.
176. (New) The apparatus of claim 157, wherein the vessel comprises a treatment chamber, the treatment chamber having a portion that is substantially hemispherical in shape.

177. (New) The apparatus of claim 157, wherein flow of the at least one sample in a liquid medium comprises laminar flow.

178. (New) The apparatus of claim 157, wherein flow of the at least one sample in a liquid medium comprises turbulent flow.

179. (New) The apparatus of claim 157, wherein the at least one acoustic field propagates with sufficient energy to induce cavitation in the liquid medium.

180. (New) The apparatus of claim 157, further comprising:
a container for holding a liquid coupling medium through which acoustic energy from the acoustic energy source travels to the vessel and the at least one sample, the liquid coupling medium contacting the vessel but not contacting the at least one sample.

181. (New) The apparatus of claim 180, wherein the acoustic energy source is located in the container so as to be in contact with the liquid coupling medium when the liquid coupling medium is held by the container.